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ABSTRACT

The question of what schools should do about individual differences among learners is discussed with reference to the cognitive theories of Piaget. Historically, teachers were not expected to adjust to individual differences; the child who could not adapt was at fault. Around the turn of the present century, educators began to turn their attention to modifying the learning environment for the child. Eventually, two approaches emerged: (1) cognitive researchers and theorists examined models of learning and information processing to search for basic teaching concepts and learning skills; and (2) practitioners looked for ways to modify the teaching/learning environment to accommodate different types of learners. The cognitive development theory of Piaget provides a philosophical foundation for a middle ground between extreme augmentational and individualistic positions. Adaptation is the balance point between the processes of assimilation, by which the learner incorporates stimuli without having to modify them, and accommodation, by which the learner modifies existing schema. Both augmentation of cognitive skills and personalization of the learning environment can be adaptive behaviors. Piaget's theory supports a middle ground that recognizes a role for augmentation and personalization, depending on the ages and needs of learners. The decision to change the learning environment or the learner becomes a practical one involving many tradeoffs. Nine references are included. (SLD)

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# EDUCATION FOR ADAPTATION

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(Learning Styles Task Force Concept Paper 3/30/84)

## Education for Adaptation

James W. Keefe

For more than a century, educators have been searching for solutions to what may be education's most basic dilemma: "What should schools do about individual differences among learners?"

In past centuries, most educators viewed learning as a commodity stored in the minds of teachers, and waiting to be dispensed. The responsibility of teachers was to impart; that of students, to partake. If students did not learn, the fault was theirs. Teachers were not expected to adjust to individual student's inability to learn in the way they taught. If the student could not adapt, the fault was the student's.

Nineteenth century educators were very much influenced by Darwinist thought. Social mobility was open to anyone who could compete for more education. Competition was the reigning ethic. Early Social Darwinists (Spencer) preached competition and merit rather than hereditary privilege as the basis for preferment. But Charles Darwin's theory of natural selection had not envisioned super-creatures; only a fitness to survive in a particular environment (ecology). Even the Spencerian doctrine of "survival of the fittest" postulated survival in a particular time and place.

Later Social Darwinists (Ward) began to emphasize the need to modify the environment. The turn of the century "scientific movement in education" looked for answers to such questions as "when should children begin school?" or "What is the best method of teaching reading?" Educators turned their attention to modifying the learning environment, but in one direction -- toward a standard way of doing things. Standardization became the primary concern of schooling.

The Progressive Movement attempted to confront the problems of standardization. Progressivists broadened their inquiries beyond "best" solutions to look at varying student aptitudes and variable learning environments. The question became, "How can we improve instruction to meet the needs of different learners?" The answers came only with difficulty.

Gradually, two approaches emerged.

1. Cognitive researchers and theorists examined different models of learning and information processing in search for basic teaching concepts and learning skills.

2. Practitioners explored various innovative methods of modifying the teaching/learning environment to accommodate different types of learners.

Some contemporary cognitive scientists argue against variable instructional settings and for developing the cognitive skills of learners so they can cope within the existing learning environment. Accepting the premise that some cognitive skills are more productive of school achievement than others, they seek to build on what exists and to train the more useful skills for greater transfer to actual school learning situations. If, for example, a student has difficulty in problem solving tasks, these cognitive proponents say train for greater problem solving skills.

At the opposite extreme, others believe in changing the learning environment, not the child. Hypothesizing the relative immutability of student learning style and cognitive skills, some practitioners and researchers advocate wide variety in learning setting, multiple resources, variable instructional methodologies, and flexible teaching. If a student has difficulty in problem solving tasks, proponents of individualization say modify the learner's instructional setting.

Middle ground does exist. The cognitive development theory of Jean Piaget provides a sound and workable philosophical foundation.

Piaget's approach to the problems of human behavior and learning reflect his formal background in biological training. In nature, species adapt both to meet the demands and to utilize the resources of their environments. Piaget subsumes two principles of biological evolution in his theory of cognitive development.

- *New structures develop in nature to fill old functions under changed conditions* (e.g. the human ear evolved from one of the gill arches of fish). Development always is rooted in what exists and evidences continuity with the past. Piaget applies this principle to human behavior by identifying the structures of each age level and showing how they adapt to the environment, to one another, and modify what the environment demands. When a child begins to talk, he is able to achieve things he could not do before and at the same time to have new goals not previously envisioned. The learner who improves task analysis skills can tackle ordinary learning more effectively and reach out to more difficult projects.

- *Adaptations in nature develop, not in isolation, but to form a coherent pattern within the total ecology* (e.g. marsupials have evolved in Australia to fill the same ecological niches that mammals occupy in other continents). Human adaptation in turn is a function not only of man's nature but of the total system in which he functions. For example, the pervasive influence of speech in human culture is evident in all our structures and social conventions. Human society is organized for verbal communication. That learning assumes verbal communication influences the way we organize classrooms, invent technology and group learners for instruction.

For Piaget, the schema is the human behavioral counterpart of structure in biology. Schemas are behavioral mediums of change and adaptation. They can be very simple like the "sucking reflex" or "grasping," or complex like understanding the number system. Piagetian schemas encompass both overt behavioral patterns and internal cognitive processes. Schemas represent the structure that adapts (Baldwin, 1967).

Piaget views intelligence as a "specific instance of adaptive behavior, of coping with the environment and organizing (and reorganizing) throught and action." (Mussen, 1963). Assimiliation and accommodation are the complementary processes of adaptation. Assimilation is the process by which the learner incorporates environmental stimuli without having to modify

existing central processing structures. The individual handles new problems and circumstances with the present stock of schemas, interpreting new situations in terms of old ones, and reacting as in past situations. Accommodation is the process by which the learner modifies existing schemas to adapt to the demands of the external environment. The individual "accommodates" to the unfamiliar environment by changing behavior. Through accommodation, individuals cope with situations that are initially too difficult -- past responses are no longer adequate.

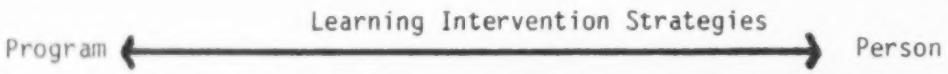
The balance ("equilibrium" or "equilibration") between the processes of assimilation and accommodation is called adaptation. Adaptation describes a recriprocal relationship between the learner and the environment. The Piagetain viewpoint sees the individual and the environment as a *gestalt*. The student and teacher not only act and react singly but the system behaves as a whole. The learner is both contributor to and recipient of the learning process. Baldwin (1967) illustrates the process in the following way:

> Consider a psychological example. The child who is eight months old may be unable to pick up a small object even though he can pick up slightly larger ones. To adapt to the demands of his environment, the child's grasping schema must accommodate to the demands of the tiny object. The gradual acquistion of the ability to pick up tiny objects can be described as an accommodation process. Once the ability has been acquired, the grasping schema can assimilate such tiny objects....
>
> The child is confronted by a new situation. How he responds to it depends on what schema is activated, and this is determined by whether the schema assimilates the relevant features of the situation. If the situation is not completely assimilated by the schema, Piaget considers the experience to constitute a food or *aliment* for the schema....In other words, it is a challenge. As a result of its interactions with such aliments, the schema gradually accommodates until it reaches an equilibrium with respect to them. At this point, the schema is capable of assimilating the situation completely.... At that point, however, the motivational aspect is also changed. Because the situation is no longer challenging, it does not activate the schema so readily and the child is not attracted by the intrinsic properties of the situation. He does not spend the rest of his life picking up small objects just because he can. The task is no longer motivating precisely because it is performed so easily and effectively....
>
> Those aspects of the situation that are assimilable but not completely assimilated evoke schemas and motivate the use of the schema until the situation has been mastered. Then the schema becomes available as a tool, but the activity is no longer intrinsically attractive. Instead, some novel feature of the situation that has not become assimilable captures the child's behavior and serves as food for his growth until he attains an equilibrium with respect to that problem. In this way, as he grows up, the child gradually becomes equilibrated to a broader and broader range of situations which he achieves

through the acquisition of increasingly broad range, organized, and systematic schemas.

Several authors (Hunt 1972; Ginsburg and Opper, 1979; Weil and Murphy, 1982) suggest that adaptive growth takes place when the challenge in the learning environment is discrepant enough from what is already mastered (assimilated) to motivate attempts at modification of the individual's cognitive structure. Learning depends on an appropriate discrepancy between the learner's assimilative and accommodative capacities and the difficulty of the task. Weil and Murphy (1982) see teachers acting as facilitators of cognitive conflict and restructuring. From this perspective, instruction is effective to the degree that it creates an appropriate inbalance between the individual and the environment. Cognitive conflict leads to disequilibrium, ongoing assimilation or accommodation, and a new equilibrium that is more stable and responsive than before. The constant readjustment inherent in the process constitutes mental development (Piaget, 1968).

Cognitive growth can then result from adapting the environment to the existing skills of the learner (assimilation), or from helping the individual adapt successfully to the demands of the environment (accommodation). These biploar approaches constitute a program-person continuum of learning strategies.




Depending on the individual's age, developmental capacities, and skill levels, both augmentation of cognitive skills and personalization of the learning environment can be <u>adapative</u> behaviors. Such a view implies that:

- All students can benefit from a responsive learning environment and the enhancement of their learning skills.
- Some students require more augmentation that personalization because their cognitive skills are so unproductive that manipulating the learning environment has little affect upon their learning.
- Students with basically sound cognitive skills benefit from a careful matching of the learning environment to their personal learning style profile.

Piaget's theory of cognitive development supports a middle ground between extreme augmentational and individualistic positions. This adapatational view recognizes that learner behavioral patterns are sometimes adequate to cope with a learning problem (assimilative) and at other times need modification (accommodation). It also understands that, in either case, the learner is attracted to learning situations that stretch individual adaptive capabilities. A learner with immature analytic skills will respond to a personalized learning environment as long as the tasks required of him do not exceed his assimilative capacity. When the task become too demanding, the learner's analytic skills must be augmented for additional learning to occur. A youngster with little sense of organization may be able to find information on a simple chart but not on a complex topographical map. A personalized

environment may promote academic learning yet not facilitate transfer to other situations for a learner deficient in concept formation skills. Some cognitive capabilities are formed only through years of experience. Deficiencies in these habits or skills are difficult to overcome.

From an instructional point of view, the decision to change the learning environment or the learner is a practical one involving a consideration of available resources, degree of learner deficiency, and other tradeoffs. From a learning style perspective, modifying the environment may be valid only for the motivational and physiological aspects of style; skill agumentation, for cognitive style. Augmentation may be the appropriate strategy for discussing cognitive style "growth," and personalization for assessing affective and physiological style "match." The answer to our opening question -- What should schools do about individual differences among learners? -- may well be "Augment the cognitive and match for the affective and physiological."

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